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CREATIVITY AND SCHOOL GRADES, AND I.T.O.C. RESULTS FOR THREE
SAMPLES OF COLLEGE STUDENTS.

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PERFORMANCE,

TWO SERIES OF TESTS WERE CONDUCTED TO DETERMINE THE
SIGNIFICANCE AND MEASURABILITY OF CREATIVITY. IN THE FIRST
SERIES, THE GROUP TEST OF CREATIVITY DEVELOPED BY RISSER AND
METFESSEL WAS GIVEN TO 425 SEVENTH GRADE STUDENTS AT ELIOT
JUNIOR HIGH SCHOOL IN PASADENA, CALIFORNIA. THE CORRELATION
BETWEEN THE CREATIVE ABILITIES MEASURED AND THE STUDENTS'
SCHOLASTIC ACHIEVEMENT WAS SIGNIFICANTLY GREATER THAN THAT
BETWEEN THEIR MEASURED IQ'S AND THEIR SCHOLASTIC ACHIEVEMENT.
IN THE SECOND SERIES, THE INDIVIDUAL TEST OF CREATIVITY
DEVELOPED BY RISSER AND METFESSEL WAS GIVEN TO 28 ART
STUDENTS AND 21 ENGLISH STUDENTS AT PASADENA CITY COLLEGE WHO
HAD BEEN IDENTIFIED AS "CREATIVE" BY THEIR INSTRUCTORS. THE
ENGLISH STUDENTS SCORED SIGNIFICANTLY HIGHER ON TWO OF THE
SIX VERBAL TESTS. THE ART STUDENTS SCORED SIGNIFICANTLY
HIGHER ON TWO OF THE PERFORMANCE TESTS. A CONTROL GROUP OF 31
PSYCHOLOGY STUDENTS SCORED SIGNIFICANTLY LOWER THAN THE
"CREATIVE" STUDENTS ON SEVEN OF THE 12 TESTS. (AD)

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R E S E A R C H

*Creativity and School Grades,
and*

I.T.O.C. Results for Three Samples of College Students

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CREATIVITY AND SCHOOL GRADES

INTRODUCTION

Creativity tests measure an important and universal aspect of intelligence that has been overlooked by traditional tests of intelligence, that is, the ability to think divergently. Questions on intelligence tests usually require the subject to recall or arrive at the one right, previously determined, answer. Typical intelligence test questions are, "Who wrote Paradise Lost?" "If $4\frac{1}{2}$ yards of lace cost \$9, how much will $3\frac{1}{2}$ yards cost?" "If the words POP, TOT, DAD, WOW, and NOON were printed on a wall and seen in a mirror, so to speak, how many of them would appear exactly as if seen directly?"

Creativity tests, on the other hand, measure a person's ability to generate a variety of ideas and to produce new and original responses. Creativity tests have questions such as, "Name as many uses as you can for a brick," "Suppose you are at school and one of the students accuses you falsely of stealing his bicycle. Name all the problems this might make for you." "Name as many clear liquids as you can." Is it possible that creativity is an intellectual ability which is as closely related to school grades as are the more commonly recognized intellectual abilities which are measured by the more familiar tests of intelligence?

The concept of intelligence has undergone considerable modification during recent years. Little is written today about a general intelligence that is applicable to all areas of human endeavor. Scientists no longer consider intelligence to be a simple, unitary factor. They speak, rather, of different kinds of intelligence. Following a parallel trend, psychologists are becoming increasingly reluctant to speak only of the degree of intelligence in terms of an I.Q. They are concerned equally with a description of the kind or nature of a person's intelligence.

A distinct contribution to scientific thinking on the nature of intelligence was made by Guilford with the development of his theoretical model of the structure of intellect. This model postulated 120 distinctly different intellectual abilities. The three dimensions of Guilford's model are products, contents, and operations. See Table I. His five operations are cognition, memory, evaluation, convergent thinking, and divergent thinking.

Although intelligence tests are concerned with the operations of cognition, memory, evaluation, and convergent thinking, the important intellectual operation of divergent thinking has been almost completely ignored. If divergent thinking, the ability which is emphasized by tests of creativity, is an intellectual process which is as significant as convergent thinking, the ability which is emphasized by traditional intel-

TABLE 1

Guilford's Model of the Structure of Intellect

OPERATIONS

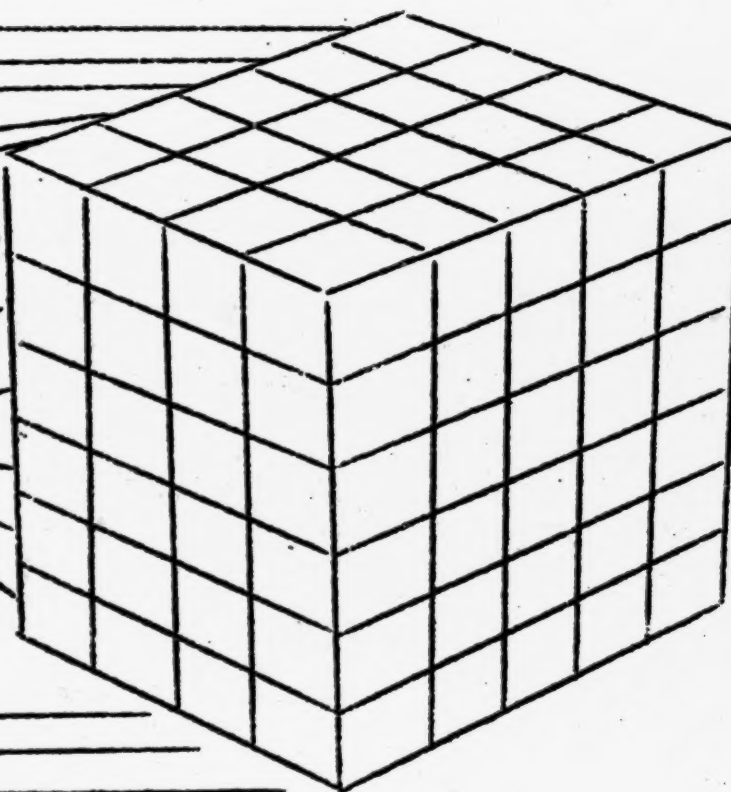
Cognition
Memory
Divergent Production
Convergent Production
Evaluation

PRODUCTS

Units
Classes
Relations
Systems
Transformations
Implications

CONTENTS

Figural
Symbolic
Semantic
Behavioral



ligence tests, tests of creativity may be expected to correlate as highly as tests of "intelligence" with school achievement.

The primary purpose of this study was to obtain additional information on the relationship between creative abilities and school achievement. G.T.O.C., the group test of creativity developed by Risser and Metfessel was chosen as the best instrument for the measurement of creativity. This test yields a score for each of six verbal tests and six performance tests for six creative abilities which have been described by Guilford.¹ These six classifications of creative abilities are, sensitivity to problems, fluency of thinking, flexibility of thinking, originality, propensity for elaboration, and redefinition ability.

PROCEDURE

G.T.O.C. was given to 425 students in the seventh grade at Eliot Junior High School in Pasadena, California. The mean I.Q. for these subjects was 109.6. Their mean grade point average was 2.67.

The standard scores for the six G.T.O.C. verbal tests were summed, and this verbal total was correlated with grade

¹Guilford, J.P. "Creativity: Its Measurement and Development." An address presented to educators of Sacramento County, Sacramento, California, January 20, 1959.

point. Likewise, the standard scores for the six performance tests were summed and correlated with grade point average. Finally the standard scores for all twelve tests were summed and correlated with grade point average.

TABLE II²

Test	Grade Point Average
California Test of Mental Maturity	.44
Iowa Test of Basic Skills (composite score)	.52
Group Test of Creativity (verbal score)	.47
Group Test of Creativity (performance score)	.52
Group Test of Creativity (total score)	.55

RESULTS

In this study of 425 seventh grade subjects, the correlation between school grades and the G.T.O.C. total scores was slightly higher than the correlations between grades and either the standard intelligence test scores or the standard achievement test scores. These results suggest that the abilities measured by G.T.O.C. are as closely related to school achievement as are the abilities and achievements measured by the more traditional tests.

²Pearson product-moment coefficient of correlations.

I.T.O.C. RESULTS FOR THREE SAMPLES OF COLLEGE STUDENTS

INTRODUCTION

It is a generally accepted fact that all creative persons do not have the same pattern of creative abilities. The inventor, portrait painter, musician, architect, and author all may be creative persons, but they undoubtedly possess creative abilities in different degrees and in different combinations. In 1965 a study was undertaken at Pasadena City College in an endeavor to discover whether students who were judged creative by their art instructors differed in their pattern of creative abilities from students who were judged creative by their English instructors. I.T.O.C., the individual test of creativity developed by Risser and Metfessel, was the instrument used for this determination. This examination employs both a verbal and a performance test for each of six creative abilities which have been identified by Guilford, namely, sensitivity to problems, fluency of thinking, flexibility of thinking, originality, propensity for elaboration, and redefinition ability.¹

PROCEDURE

The instructors at Pasadena City College were invited to nominate students in their departments whom they considered to be creative. The instructors were told specifically that the interest was not in the students who were making the highest grades, but

¹Guilford, J.P. "Creativity: Its Measurement and Development." An address presented to educators of Sacramento County, Sacramento, California, January 20, 1959.

rather in those who were the most creative and original.

All of the students nominated agreed to participate in the study. Form A of I.T.O.C. was given to 28 students who had been identified as creative by their art instructors and to 21 students who had been identified as creative by their English instructors. For comparative purposes, I.T.O.C. was also given to a convenient incidental sample of 31 students in a freshman psychology class. The tests were administered by two certified psychologists who held pupil personnel credentials with authorization to perform psychological services in the schools.

DISCUSSION

If creative abilities are present in different degrees and in different combinations in all persons, it might be reasonable to expect creative English students to score higher on the I.T.O.C. verbal tests and the creative art students to score higher on the performance tests. The scores on the I.T.O.C. verbal tests is determined by the number of ideas the subject can generate and express verbally. The score on the performance tests is not dependent on verbalization, but is based on ideas that an individual can communicate by drawing or pointing.

RESULTS

The English creatives scored significantly higher than the art creatives at the $P < .05$ level on two of the six verbal tests (propensity of elaboration and redefinition ability). The art

creatives scored significantly higher than the English creatives at the $P \leq .05$ level, on two of the six tests (propensity of elaboration and redefinition ability). The other differences failed to reach the 5% level of significance. The statistical test used was the Mann-Whitney U one tailed test.

Next the scores of the creative students (English and art) were compared with the test scores from the incidental sample of psychology students. Again using the Mann-Whitney U statistical test, the creative students scored higher than the students in the incidental sample, significant at the $P \leq .01$ level, on seven of the twelve I.T.O.C. tests. See table 1.

Finally, to ascertain whether there were sex differences for any of the I.T.O.C. subtests, the results for the thirty-seven women in the three sample groups were compared with the results for the forty-three men. The Kolmogorov-Smirnov two tailed test was used which is sensitive to any kind of difference in the sampling distributions. At the $P \leq .05$ level of significance, a difference was found for one of the I.T.O.C. subtests, verbal fluency of thinking, in favor of the men. See table 2.

TABLE 1

SIGNIFICANCE OF DIFFERENCES BETWEEN SCORES OF THE
 CREATIVE SAMPLE¹ AND THE INCIDENTAL SAMPLE²
 ON I.T.O.C. SUBTESTS USING THE MANN-
 WHITNEY U ONE-TAILED TEST

Creative Ability	z Values	P
Sensitivity to Problems, verbal	1.29	.10
Fluency of Thinking, verbal	1.03	.15
Flexibility of Thinking, verbal	3.97	<.001
Originality, verbal	.68	.25
Propensity for Elaboration, verbal	1.25	.11
Redefinition Ability, verbal	5.64	<.001
Sensitivity to Problems, performance	4.95	<.001
Fluency of Thinking, performance	2.19	.01
Flexibility of Thinking, performance	2.32	.01
Originality, performance	.70	.24
Propensity for Elaboration, performance	3.63	.001
Redefinition Ability, performance	2.43	.01

¹(n₁ = 49)

²(n₂ = 31)

TABLE 2

SEX DIFFERENCES FOR I.T.O.C. SUBTESTS SHOWN BY RAW
SCORE MEANS AND KOLMOGOROV-SMIRNOV D VALUES

Creative Ability	Mean Raw Score		Kolmogorov- Smirnov ¹ D Values
	Men (n=43)	Women (n=37)	
Sensitivity to Problems, verbal	10.23	9.81	.084
Fluency of Thinking, verbal	9.42	8.05	.319
Flexibility of Thinking, verbal	11.07	10.41	.149
Originality, verbal	8.65	7.76	.114
Propensity for Elaboration, verbal	10.44	11.05	.125
Redefinition Ability, verbal	15.98	16.05	.238
Sensitivity to Problems, performance	20.81	19.05	.237
Fluency of Thinking, performance	11.33	11.87	.062
Flexibility of Thinking, performance	16.16	16.51	.114
Originality, performance	18.12	17.92	.219
Propensity for Elaboration, performance	19.75	18.93	.125
Redefinition Ability, performance	22.67	22.13	.063

¹Kolmogorov-Smirnov D and corresponding probability values:

D .366 = P .01

D .305 = P .05

D .273 = P .10